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PRELIMINARY REPORT ON 1939 - 1940 DEVELOPMENTS AT THE U. S. COTTON GINNING LABORATORY

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The research program of the United States Cotton Ginning Laboratory at the present time is divided into two parts; one dealing with harvesting, handling, conditioning, cleaning, extracting methods and saw and roller ginning processes, and the other with pressing and packaging bales to higher densities at the gin. Each project requires a staff of specialists, which, for the engineering responsibilities are provided by the Bureau of Agricultural Chemistry and Engineering, and for the quality and marketing phases are provided by the Agricultural Marketing Service. In the Washington activities for the latter Service, the quality activities concerned with ginning are a part of the program of Cotton Quality and Standardization Research, under the leadership of R. W. Webb, and the economic and quality aspects of packaging are headed by John W. Wright; while at Stoneville, both are handled by Francis L. Gerdes.

The cotton farmer benefits directly by good ginning. The ginner must obtain a reasonable profit for his services if he is to continue to provide them; and to this end the research and development program of the U. S. Cotton Ginning Laboratory is designed to improve the quality of American cotton, and as such is in the interest of both the producer and the ginner, because they have a mutual interest in the cotton enterprise.

The equipment requirements of today's gin must conserve power, embrace simplified machinery suitable to regional needs and afford certain other necessary features with which the grower is vitally concerned.

In the light of our present outlook on the industry, a modern gin should include such features as a conditioner or drier, a pure seed handling system, adequate cleaning--extracting machinery, economical fans and piping, and a suitable packaging outfit.

In the 1939 ginning season, almost 1,100 out of the 11,884 gins in the United States operated driers, of which 250 were in Oklahoma and Texas. From reports furnished by ginners operating driers in these states during the 1939-40 ginning season it was found in calculations made at the Laboratory that bale enhancements averaged $3.59 a bale on damp or wet cotton and $1.21 a bale on dry cottons, as a result of conditioning and cleaning cotton with drying equipment. The driers also showed relative capacity increases of 23 percent and 6 percent respectively for these respective groups of cottons. The operating costs of the driers averaged only 13 cents per bale in Oklahoma and Texas, and those gins which had driers reported an average increase in their volume of business of 226 bales.

The United States Cotton Ginning Laboratory is revising its Bulletin No. 239, on Vertical Driers for Seed Cotton, in order to describe recent forms of tower driers and to replace the exhausted supply of the older bulletin. Low towers appear to predominate among new forms of tower drier installations and include those set over cleaners, pressure delivery outfits, and Rembert-type supply systems whose draw-through features neutralize separator leaks in old gins. While awaiting the printing of the new bulletin, ginners are invited to write to Stoneville regarding any of these systems which may interest them.

Pure seed handling methods are rapidly gaining recognition. Single variety communities are not the only ones which profit from this. At the Ginning Laboratory, self-cleaning belts and seed blowing systems are both used, and in some of the cooperating two-story gins, the bottoms of the seed auger troughs have been hinged so that little labor is involved in cleaning out the gin for handling even single bales for planting seed. Much interest also centers about work now under way with rotary blowers instead of fans for reducing the horsepower in handling seed. Pure seed blowing systems at the Laboratory have been set up with pipes which are smaller than those now generally in use, and indicate that even with fans instead of blowers, energy required for handling seed per gin stand should not exceed two horsepower.

Cleaning and extracting problems differ with regions. Our survey in Oklahoma gins in cooperation with the cotton export program, indicated that 76 percent were equipped with master extractors and overhead cleaning as compared with 63 percent in West Texas, and only 9 percent in the Mississippi Delta. Twenty percent of the Oklahoma gins with master extractors also had an average of 15 cylinders of overhead cleaning and 20 percent had master extractors plus unit extractor feeders. However, forty-four percent of the Oklahoma gins had unit extractor feeders operating at an average speed of 530 r.p.m., and the remaining 56 percent were equipped with big drum or multicylinder cleaning. From an engineering standpoint, there appears to be opportunity in some cases to combine drying equipment with cleaning and extracting equipment in such a manner as to obtain an effective service without the complexity involved in having both master and unit extractor feeders, which should lead to a beneficial reduction in power. The semi-arid regions have static problems which must be solved before reduction in cleaning equipment can be achieved.

A power survey made during 1938-39 by the staff of the Laboratory at 63 representative gins in the Mississippi Delta brought out some very interesting facts in regard to the power waste incurred through fans and piping. The survey indicated that fans and piping consumed approximately 40 percent of the total power used for ginning, and that this power ranged from 19 percent for efficient gins to 64 percent for inefficient ones. Separators showed leaks ranging from 17 percent to 60 percent of the air handled by the fan, which is a significant item of waste, because the separator leaks do not perform any useful work. In one group of gins where the separator loss averaged 42.7 percent the power required to operate the cotton suction fan was 27.6 horsepower for 4-stand outfits as compared to only 19.2 when the separator losses were reduced to 27.3 percent. In other words a reduction of 15.4 percent in the leakage of the separator resulted in the direct saving of 8.4 horsepower. Suction pipe diameters across the entire Belt appear to be too large. In the Mississippi Delta the average for 3-stands is 11.7 inches when 10 inches should serve more economically; 12.3 inches for 4-stands when 11-inch suction pipe is recommended, and 13 inches for 5-stands where 12-inch piping should be ample.

There appears to be an opportunity for Oklahoma ginners to accomplish some saving in the regulation of air-blast nozzle pressures, although the average pressure of 12.6 inches (water gauge) shown by the Laboratory survey indicates that in this instance the Oklahoma ginners are apparently operating more nearly to economical conditions than some of the other states. Results of surveys of representative gins in West Texas showed an average of 14.3 inches of water, and those of the Mississippi Delta, 13.4 inches on their air-blast nozzles.

The Laboratory studies in gin saw speeds have contributed to material profits for the ginners where older gins have increased their saw speeds within the range of 550 to 600 r.p.m. In making these changes the picker roller and feeder speeds are retained approximately at their original settings, along with constant brush speeds. The average saw speed of the Oklahoma gins surveyed was 520 r.p.m. Over 50 percent of these gins were operating at less than 500 r.p.m., and in most cases it is believed that an increase in saw speeds to 550 to 600 r.p.m. would prove very gratifying in increased capacity and better ginning without materially affecting the power.

One of the complaints which is being registered against some of the cotton gins relates to big-ended and rolling bales which give trouble at the compresses and may frequently result in objectionable cutting. Studies by the pressing and packaging project at the United States Ginning Laboratory in combination with field surveys and inspections, indicate that compress-cutting is not due solely to faults at the cotton gins, but it is known that the gin dogs and the lack of uniformity in the bale are contributing factors to the cutting.

It has been definitely proved that there is no such thing as actual air-cuts and that cutting of the bales during the process of compression is by no means a new phenomenon. It has also been found that there is a perceptible but not very important increase in spinning waste in the case of bales

severely cut during compression, although indications are in some instances that the manufacturing performance of the cotton and the appearance and the strength of the yarn from portions of the bale having cuts are slightly less satisfactory. Although in many instances, the cutting of bales during compression is not of great significance from the standpoint of its effect on the spinning value of the bale of cotton, the effect of such cutting upon the appearance of the bales and upon the protection afforded by the bale covering warrants our best efforts to find a means for its elimination. Many different reasons have been advanced for cutting, and some of the experiments by the Ginning Laboratory were quite interesting. In these, round-ended pieces of iron in the form of cylinders and balls were placed within the bale prior to the compressing of the cotton at the local compresses. Large cuts could be obtained when these foreign materials were placed within the bale. Cuts were also obtained when the dog ridges on the sides of the bale fell in line with the platen channels of the compress. Apparently the dense spots in the bale which are associated with these dog ridges cause an uneven pressure to be set up during compression of the bale and this results in mechanical shearing of the fibers at the point of uneven density. The pieces of iron which the Laboratory used reproduced these conditions almost at will. A number of valuable instruments were developed at Stoneville, including a meter for the measurement of pressures on the surface of the bale. Pressure readings on surfaces of bales with this meter proved conclusively that bale cutting during re-compression occurred more frequently at points of greater density. Gauge pressures were obtained in the ram casing when pressing out both flat and high density bales.

The major problems in the pressing and packaging studies at the United States Cotton Ginning Laboratory consequently deal not only with the possibilities of obtaining greater densities at the gins but also concern the appearance of American cotton bales, better protection against loss and deterioration, elimination of fiber damage, and lower cost of packaging. All of these are becoming more significant to American cotton producers because of the increase of foreign competition. Some of the main objectives of the work include: (1) to ascertain the engineering and mechanical feasibility of packaging cotton in higher density 500-pound bales at gins; (2) to find the comparative costs and advantages of such higher density gin pressures as compared to the customary procedures; (3) to determine the effect of higher densities on the spinning value of cotton; (4) to work out the requirements for a high density gin bale package which will best meet the needs in preserving the quality of the cotton and for all purposes of transportation, storage, and handling; (5) to ascertain the mechanical and economic feasibility of providing equipment at the cotton gin and for the operation of the gin to assure the packing of each bale with cotton of uniform quality.

To carry out this broad field of study, the U. S. Cotton Ginning Laboratory has a special experimental 3-80 gin outfit equipped with a double drying system, unit extractor feeder, conveyor distributor, 4-cylinder cleaner, pure seed handling system, and several presses, each valved to the lint flue. During 1939 the presses comprised a single-story flat bale press,

Clayton 12-roll round bale press, and Brazilian-type 400-pound bale high density press. During the coming season it is expected that a 500-pound bale press for 25 pounds per cubic ft. density will be added to the equipment. In addition to these presses, the Laboratory has a separate experimental pilot press which makes bales of 1 cubic ft. volume at various densities from 11 to 44 pounds per cubic ft. In making up specimen bales on the experimental pilot press for spinning purposes, when 44 pounds of lint were compresses into one cubic foot of bale space, the hydraulic pressures required were approximately 3500 pounds per square inch within the ram casing. This equalled the pressure upon the cotton which a square foot column of stone three tims as high as the Washington monument would produce.

Several hundred bales of cotton were handled in experimental tests during the past season and spinning tests are now being conducted on selected lots of cotton involved in the tests. Observations were also made at four representative compresses in the Mississippi Delta, and in the West Texas region, on approximately 25,000 bales of cotton with a view of determining the percentage of cut bales represented in the ginning of each of the gins studied and thus ascertain if peculiarities in the gin handling and pressing equipment was responsible for the bale cutting. Due to the fact that all these studies were new and without comprehensive data on the subject, no conclusive results have as yet been published.

I wish to take this opportunity on behalf of our colleague, Francis L. Gerdes, to express his kind regards to you and his regrets that he could not be present to renew his acquaintance with you as he did the last time we were able to attend. However, the heavy pressure of our work has necessitated an arrangement whereby we alternate with each other in the attendance of those state Ginners' Associations with which we have an opportunity to meet.

And also in behalf of the Bureau of Agricultural Chemistry and Engineering and the Agricultural Marketing Service, under whose joint direction the U. S. Cotton Ginning Laboratory is operated, we wish to extend a cordial invitation to all of your members, and to all the ginners in the state together with any farmer-ginners who might be interested, to visit the Laboratory at Stoneville, Mississippi, at any convenient time.